

CLAIMS

What is claimed is:

1. An apparatus for generating AC power to a load, comprising:
 2. a variable speed energy generating device producing differing amounts of power at different speeds;
 3. a power conditioning system coupled to said variable speed energy generating device, wherein said power conditioning system calculates a speed command based on said AC power that controls said variable speed energy generating device;
 4. a regulator section coupled to said power conditioning system; and
 5. a converter coupled to said regulator section and producing said AC power, wherein said converter couples said AC power to said load.
- 11
1. The apparatus according to claim 1, wherein said converter is selected from the group consisting of: transformerless AC pulse width modulator inverter, DC-AC inverter, static inverter, rotary converter, cycloconverter, and AC-AC motor generator set.
- 5
1. The apparatus according to claim 1, wherein the variable speed energy generating device is selected from the group consisting of: internal combustion engine, turbine, micro-turbine and Stirling engine.
- 4
1. The apparatus according to claim 1, wherein said regulator section is an enhanced conduction angle dual boost DC bus voltage regulator.
- 3
1. The apparatus according to claim 1, further comprising a field winding coupled to said variable speed energy generating device.
- 3
1. The apparatus according to claim 1, further comprising a speed sensor coupled to said variable speed energy generating device.

- 1 7. The apparatus according to claim 1, wherein said speed command is derived
- 2 from engine speed versus load lookup tables.
- 3
- 4 8. The apparatus according to claim 1, wherein said speed command is
- 5 calculated from exhaust content sensors.
- 6
- 1 9. The apparatus according to claim 1, further comprising a bypass switch
- 2 coupling said variable speed energy generating device to said load.
- 3
- 1 10. The apparatus according to claim 1, further comprising an adaptive speed
- 2 loop gain algorithm for detecting steady state speed errors.
- 3
- 1 11. A method for producing quality AC output power to a load, comprising:
2 measuring a set of properties for an actual load output;
3 measuring a speed of a variable speed energy generating device;
4 calculating a speed command signal using said speed and said properties;
5 converting said speed command signal into a throttle adjustment signal; and
6 adjusting said speed of said variable speed energy generating device using
7 said throttle adjustment signal, thereby adjusting said AC output to said
8 load.
- 9
- 1 12. The method according to claim 11, further comprising:
2 calculating a load shed term; and
3 reducing a portion of said load based on said load shed term.
- 4
- 1 13. The method according to claim 11, further comprising:
2 measuring a throttle position; and
3 calculating said speed command signal using said speed, said properties,
4 and said throttle position.

5

1 14. The method according to claim 11, further comprising:
2 regulating a generator voltage by adjusting a field voltage of a generator of
3 said variable speed energy generating device.

4

5 15. The method according to claim 11, further comprising:
6 increasing said speed and observing an increase speed error;
7 decreasing said speed and observing a decrease speed error; and
8 calculating a steady state speed error.

9

1 16. A variable speed generator system, comprising:
2 a variable speed engine with a throttle control;
3 a generator coupled to said variable speed engine and generating an AC
4 output;
5 a voltage regulator section coupled to said AC output and producing a
6 voltage regulated output;
7 an inverter coupled to said voltage regulated output, wherein said inverter
8 output is coupled to a load; and
9 a power conditioning system having a speed versus load controller, wherein
10 said speed versus load controller adjusts said throttle control based upon a
11 speed command that is derived from said AC output and a speed versus load
12 table.

13

1 17. The variable speed generator system according to claim 16, wherein said
2 voltage regulator section is an enhanced conduction angle (ECA) dual boost
3 DC bus voltage regulator.

1

2 18. The variable speed generator system according to claim 16, wherein said
3 speed versus load controller comprises a field control loop and a speed
4 control loop.

5

- 1 19. The variable speed generator system according to claim 16, wherein said
- 2 speed versus load controller comprises a field control loop, a speed control
- 3 loop, and a throttle position feedback loop.
- 4
- 1 20. The variable speed generator system according to claim 16, further
- 2 comprising a throttle valve actuator coupled to said engine.
- 3
- 1 21. The variable speed generator system according to claim 16, further
- 2 comprising a load shed term processing loop.
- 3
- 1 22. The variable speed generator system according to claim 16, wherein said
- 2 load is a grid and said inverter output is a current source coupled said grid.
- 3
- 1 23. The variable speed generator system according to claim 16, wherein said
- 2 inverter output is a voltage source coupled said load.
- 3
- 1 24. The variable speed generator system according to claim 16, wherein said
- 2 load versus power table is based conditions selected from the group
- 3 consisting of: maximum fuel efficiency, minimum emissions, and optimum
- 4 transient load response.
- 5
- 1 25. The variable speed generator system according to claim 16, further
- 2 comprising an energy storage module coupled to said voltage regulator
- 3 section.
- 4
- 1 26. The variable speed generator system according to claim 16, further
- 2 comprising an adaptive speed loop gain algorithm for detecting steady state
- 3 speed errors.